

LL – 10R

U S E R ' S G U I D E

Version 1.0



CAPELON

Contents:

- General 3
- Features 3
- Specifications 3
- Installation..... 4
 - Mounting* 4
 - Pulse inputs* 4
- General 5
- LONMARK-Object 6
- Description of Network Variables (SNVT) and Configuration Parameters (SCPT) 6
- Description of Network Variables (SNVT) and Configuration Parameters (SCPT) 7
 - Invalid configuration input*..... 9
- Number of Digits in Meter Readout 9
- Configuration of Pulse Constant 10
- Resource Files 12
 - General* 12
 - Installation of Resource files*..... 12
- LNS-Plugin 13
- OTHER..... 14
 - Unconfigured*..... 14
 - Wink* 14
 - Alias* 14
 - Service Led*..... 14

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General

LL-10R is a LON-based meter reading module with four pulse input channels.

The pulse inputs can be used to register pulses from electricity meters, water meters and heat meters.

LL-10R communicates on twisted pair (TP/FT-10) or powerline.

Features

- ◆ Connect to pulse based meters
- ◆ Cost effective, handles four meters
- ◆ TP/FT-10 and powerline communication
- ◆ DIN-rail mounting or wall mounting
- ◆ Designed according to LONMARK® v. 3.3.
- ◆ LONMARK functional profile "Pulse Meter"

Specifications

TECHNICAL DATA

LonWorks®-communication	Twisted Pair Free Topology TP/FT-10, 78 kbps Powerline communication, C-band
Meter input	Four S0-based pulse inputs (DIN 43864)
Enclosure	BxHxD 127x117x50, ABS/Plastic, IP30, 35 mm DIN- or wall mounting, weight 0.5 kg
Power Supply	2x230 VAC (-15%/+10%), 50-60Hz or 24 VAC +/- 10%
Power Consumption	1 W
LED Indication	Service Led (status indication)
Humidity	0-90% RH without condensation
Temperature	0-50 °C (operating)
EMI	EN 60950, EN-55022, EN-61000-4-2, EN-61000-4-3, EN-61000-4-4, EN-61000-4-6
Realtime clock	No
Backup	Minimum seven days

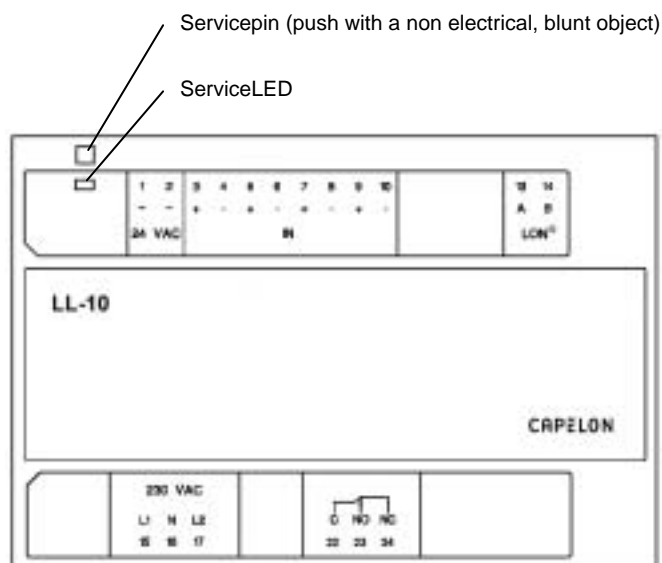
Installation

Mounting

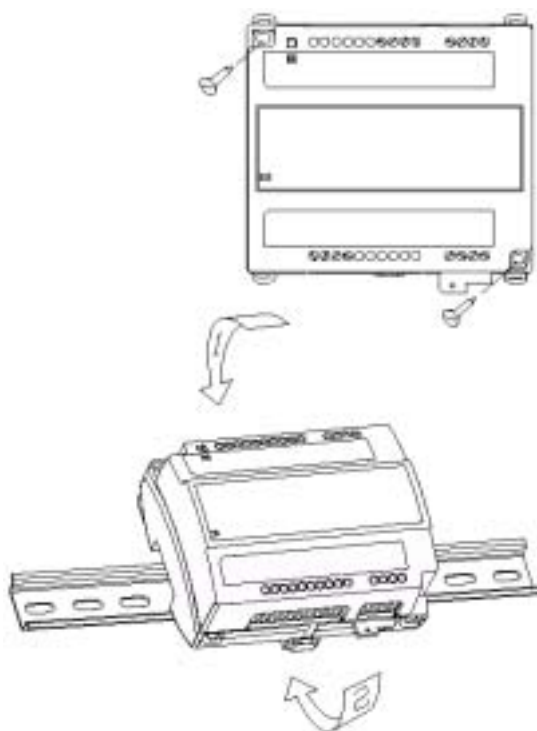
LL-10 is cabinet mounted on a TS 35 mm norm rail (EN 50 022) or screwed onto a wall with two screws. Diameter of screws max M4, screw head max Ø7.5 mm (0.3 in).

Pulse inputs

All inputs are active with outgoing current (S0).



The above picture shows the TP/FT-10 based model



Screw Terminal Connections for TP/FT-10 based model:

Part no.	24VAC	230VAC	IN1	IN2	IN3	IN4	LON
P218-0210, P219-0210, P219-0211		15,17 16	3-4	5-6	7-8	9-10	13-14
P218-1210, P219-1210, P219-1211	1-2		3-4	5-6	7-8	9-10	13-14

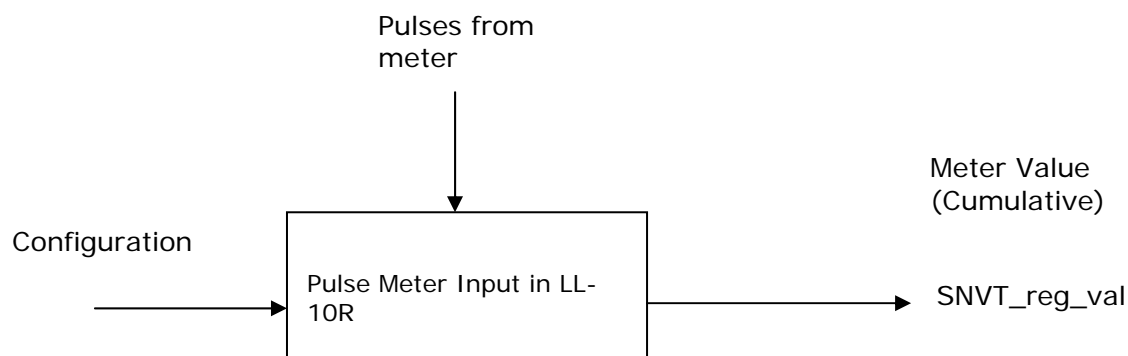
Note! Screw terminal connection for the communication bus is marked "LON".

Screw Terminal Connections for PLC based model:

Part no.	24VAC	230VAC	IN1	IN2	IN3	IN4	LON
P219-0220, P219-0221		15,17 16	3-4	5-6	7-8	9-10	
P219-1220, P219-1221	1-2		3-4	5-6	7-8	9-10	23-24

General

Figuren nedan beskriver schematiskt en mätaringång i LL10R.



The Pulse Meter input is used for pulse based meters that measures for example energy or volume. Pulses are registered and converted to an actual meter value and presented as Total (Cumulative) Meter Value on the LON network.

The meter value is presented using the network variable type *SNVT_reg_val*. This type contains the meter value as fixed decimal integer. The type also contains information about the unit and number of decimals.

SNVT_reg_val	Description
raw	A 32 bits integer representing the cumulative meter value.
unit	Indicates the unit, for example kWh, litre or cubic meter.
nr_decimals	Indicates the number of decimal in the raw value.

Example:

raw = 12345

unit = 20 (RVU_M3)

nr_decimals=1

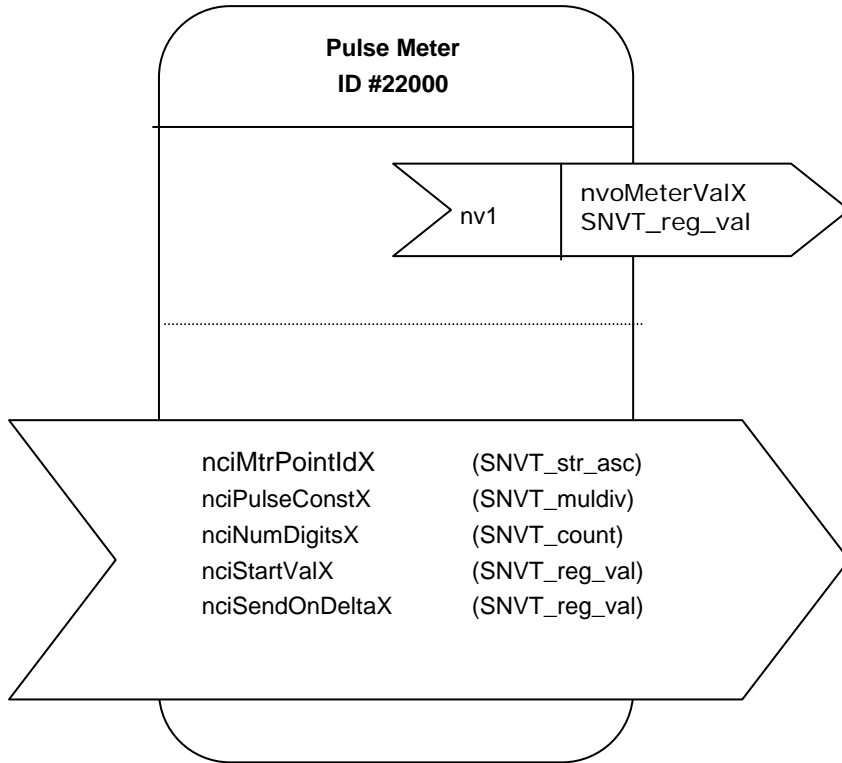
The above correspond to 1234.5 m³

For further information about the SNVT variables please see the document "LONMARK® SNVT Master List". It can be downloaded from www.lonmark.org.

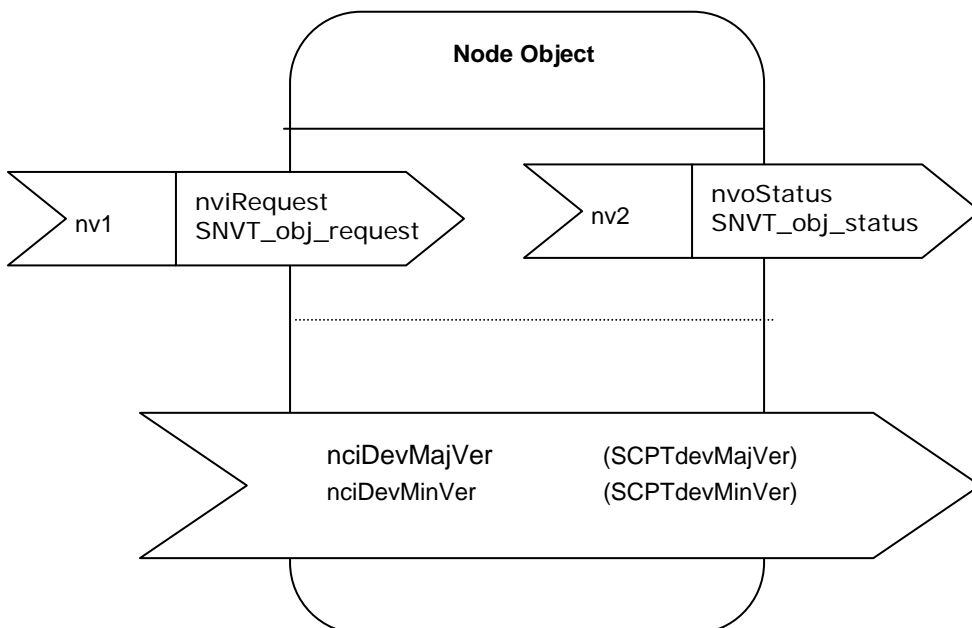
The Pulse Meter Input is configured with a pulse constant, a transformer constant, a number of digits on meter display and a base value which is a value that LL-10R starts adding pulses to. See below a description of a functional profile (LonMark Object) for a Pulse Meter Object.

LONMARK-Object

LL-10R has four LONMARK-object implemented with a user-defined functional profile called *Pulse Meter*. See next section "Description of Network Variables (SNVT) and Configuration Parameters (SCPT)" for more information.



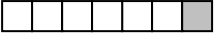
A Node Object is implemented according to LONMARK-guidelines.



Description of Network Variables (SNVT) and Configuration Parameters (SCPT)

Standard Network Variable (Type)	Range (Default Value)	Description
nvoMeterValX <i>SNVT_reg_val</i> <i>(X indicates pulse input 1 - 4)</i>	0 – 999 999 999 See "Number of Digits in Meter Readout".	This output variable reports the total cumulative value for each pulse meter input. The variables are updated continuously. If the variable is bounded the value is transmitted according to condition set by <i>nciSendOnDelta</i> . Unit and number of decimals are specified by <i>nciStartValX</i> .

Standard Configuration Parameters SCPT (Type and SNVT reference)	Range (Default Value)	Description
nciPulseConstX <i>UCPTpulseConst</i> <i>SNVT_muldiv</i>	1-210 (Transformer) / 1-2100 (Pulse) (1/1)	This network variable provides scaling of the registered pulse value. The data type provides the following fields: Multiplier: 16-bits multiplier, may correspond to transformer constant. Divisor: 16-bits divisor, may correspond to a pulse constant LL-10R registers pulses and calculate a total meter readout using the following relation: total meter readout = number of pulses * multiplier / divisor Important! The Pulse Constant Value should be entered as number of pulses per unit. The unit is given in the base value that is <i>nciStartValX</i>. The base value is described further down in this table. Normally the pulse constant must be updated when the meter is installed or replaced. To assure that the meter and the LL-10R is synchronised, we recommend updating the base value (<i>nciStartValX</i>) when the pulse constant is changed.

Standard Configuration Parameters SCPT (Type and SNVT reference)	Range (Default Value)	Description
nciNumDigitsX <i>UCPTnumDigits</i> <i>SNVT_count</i>	4 - 9 (7)	<p>This network variable should be set to the maximum number of integers that the meter display can show. The purpose of this configuration is to assure that the LL-10R is "rolling over" when the meter is "rolling over".</p>  <p>For example, if the display on the meter can show 6 integer digit and one decimal digit then the value of <i>nciNumDigits</i> should be 6.</p> <p>The highest value that LL-10R can report depends on the value of <i>nciNumDigits</i> and number of decimal digits that is to be displayed.</p> <p>See description below in section "Number of digits in meter read out".</p>
nciStartValX <i>UCPTstartValue</i> <i>SNVT_reg_val</i>	0 – 999 999 999 "Number of digits in meter read out". (raw= 0 unit=RVU_KWH nr_decimals=1)	<p>This network variable is used to set a new base value for the given pulse meter input. When this value is updated, the current meter readout value <i>nvoMeterX</i> will start showing the entered <i>nciStartValX</i> value.</p> <p>The entered value may not exceed a value corresponding to a value set by <i>nciNumDigits</i>.</p> <p>This configuration variable also specifies the value unit and number of decimals that is used.</p> <p>The base value must be different from the previous value in order for an actual change to occur.</p>
nciSendOnDeltaX <i>SCPTsndDelta</i> <i>SNVT_reg_val</i>	0 – 999 999 999 (raw= 10 unit=RVU_KWH nr_decimals=1, i.e. 1.0 kWh)	<p>This network variable specifies the minimum change that must occur before the value is propagated onto the network. A zero value will disable automatic propagation.</p> <p>If a collecting system always is polling the LL-10R through bounded updates, the <i>nciSendOnDelta</i> may be set to a zero value.</p> <p>Unit and number of decimals are specified by <i>nciStartValX</i>.</p>
nciMtrPointIdX <i>SCPTlocation</i> <i>SNVT_str_asc</i>	(Meter X)	<p>This network variable may be used as a location string or a text description.</p>
nciDevMajVer <i>SCPTdevMajVer</i> <i>no SNVT reference</i>	(2)	<p>This network variable corresponds to the high number in the program version ID.</p>

Standard Configuration Parameters SCPT (Type and SNVT reference)	Range (Default Value)	Description
nciDevMinVer <i>SCPTdevMinVer</i> <i>no SNVT reference</i>	(0)	This network variable corresponds to the low number in the program version ID.

Invalid configuration input

An invalid input is ignored and the previous value will be kept.

Note! Allowed input limits may vary and depend on the current setting of another configuration variable. For example the input for *nciStartValX* depends on value of *nciNumDigitsX* (see previous section where configuration variables are described)

LL-10R will not accept an invalid configuration value. If the installation is done with for example a LNS-based network tool there is a risk that LNS database will contain invalid configuration value if such value was written by the user. It may cause confusion, thus we recommend the user to synchronize the database with the actual configuration values in the device. In LonMaker this is done by right-hand clicking on the device and then select "*Resync CPs...*", and then select "*Upload values from device*".

Number of Digits in Meter Readout

The highest number that a meter readout that can be reported by LL-10R depends on the specified number of digits (specified by *nciNumDigits*) and the specified number decimal that is used (specified by *nciStartValX.nr_decimals*)

Allowed combinations are presented in the below table.

Number of Digits (<i>nciNumDigits</i>)	Number of Decimals (<i>nciStartValX.nr_decimals</i>)			
	0	1	2	3
	Maximum Meter Readout			
4	9 999	9 999,9	9 999,99	9 999,999
5	99 999	99 999,9	99 999,99	99 999,999
6	999 999	999 999,9	999 999,99	999 999,999
7	9 999 999	9 999 999,9	9 999 999,99	not valid
8	99 999 999	99 999 999,9	not valid	not valid
9	999 999 999	not valid	not valid	not valid

Configuration of Pulse Constant

LL-10R is shipped in a configured on-line state. This means that the LL-10R will start register pulses immediately. Factory setting for the Pulse Constant is 1/1 and the meter base value is zero.

In order to get correct meter readouts, LL-10R must be configured with a pulse and transformer constants that corresponds to pulse and transformer constants of the connected meters. See the description of *nciPulseConst* on page 7.

First we define the following events:

Physical Installation: when the LL-10R is physically and connected to the meter and powered up

Commission: when the LL-10R is logically installed with a network tool and configured

Below is three installation scenarios described:

1. Physical Installation and Commission is carried at the same time:

1. Connect the meter(s) to the LL-10R
2. Write the max number of digits that the LR-10R should display, normally the same as the display on the meter (*nciNumDigits*).
3. Write the pulse constant (*nciPulseConst*)
4. Read the total readout from the meter
5. Write the total readout as a Start Value (*nciStartVal*). In this step the Unit and Number of decimals are also entered.
6. If necessary, configure the SendOnDelta propagation condition (*nciSendOnDelta*)
7. If necessary, configure Meter Point Identity (*nciMtrPointID*)

2. Physical Installation and Commission is not carried at the same time but the meter readout can be read during Commission:

At Physical Installation:

1. Connect the meter(s) to the LL-10R

At Commission:

2. Write the max number of digits that the LR-10R should display, normally the same as the display on the meter (*nciNumDigits*).
3. Write the pulse constant (*nciPulseConst*)
4. Read the total readout from the meter
5. Write the total readout as a Start Value (*nciStartVal*). In this step the Unit and Number of decimals are also entered.
6. If necessary, configure the SendOnDelta propagation condition (*nciSendOnDelta*)
7. If necessary, write Meter Point Identity (*nciMtrPointID*)

3. Physical Installation and Commission is not carried at the same time and the meter readout cannot be read during Commission:

At Physical Installation:

1. Connect the meter(s) to the LL-10R
2. Read and make a note of the total readout from the meter

At Commission:

3. Read and make a note of the total readout from the LL-10R that is the number of pulses that has been registered since the physical installation.
4. Convert the readout to a pulse value. Normally the *nciPulseConst* is set to 1/1 at delivery which means that the number of pulses is equal to value read in step 3.
5. Use the converted pulse value to calculate a meter value using the actual meter pulse constant, see relationship on page 7.
6. Add the calculated meter value in step 5 to the value noted during step 2.
7. Write the max number of digits that the LR-10R should display, normally the same as the display on the meter (*nciNumDigits*).
8. Write the pulse constant (*nciPulseConst*)
9. Write the total readout calculated during step 6 as a Start Value (*nciStartVal*). In this step the Unit and Number of decimals are also entered.
10. If necessary, configure the SendOnDelta propagation condition (*nciSendOnDelta*)
11. If necessary, write Meter Point Identity (*nciMtrPointID*)

Below is an example of scenario 3.

A meter has a LCD display that can show 7 digits. One of digits is decimal digit. The Total Meter Readout is *12234,5 kWh*.

At the physical installation, the meter is connected to a LL-10R. Factory setting for the pulse constant *nciPulseConst* = 1/1. The start value *nciStartVal* is 0. In this example the pulse constant is 1/640, that is 640 pulses per kWh.

At a later time the meter is commissioned. The meter value *nvoMeterValX* is read from the LL-10R to be *2880.0 kWh*. Note that this value is corresponding to a default pulse constant with the value 1/1. To obtain the correct meter value the read value must be converted into pulses and then back to meter value using the correct pulse constant. In this case the default pulse constant (=1/1) were used and thus the read meter value is actually the number of pulses that have been registered by the LL-10R. It is shown below:

*meter value = number of pulses * multiplier / divisor*

*number of pulses = 1/1 * 2880 = 2880 pulses*

The new meter value based on the actual pulse constant is calculated as follow:

*meter value = 2880 * 1 / 640 = 4,5*

The Total Meter Readout (Total Meter Value) is:

Meter Readout at physical installation + New meter Value when commissioned

Total Meter Value = 12234,5 + 4,5 = 12239,0 kWh, this value should match the value on the meters display at the time of the commission.

Configuration is done by setting the following values:

nciNumDigits = 6

nciPulseConst = 1/640

nciStartVal = 12239,0 kWh

raw = 122390

unit = RVU_KWH

nr_decimals = 1

Resource Files

General

Resource files must be added to the LDRF catalog file (LonMark Device Resource File) in a separate step. See the following section *Installation of Resource Files* for details.

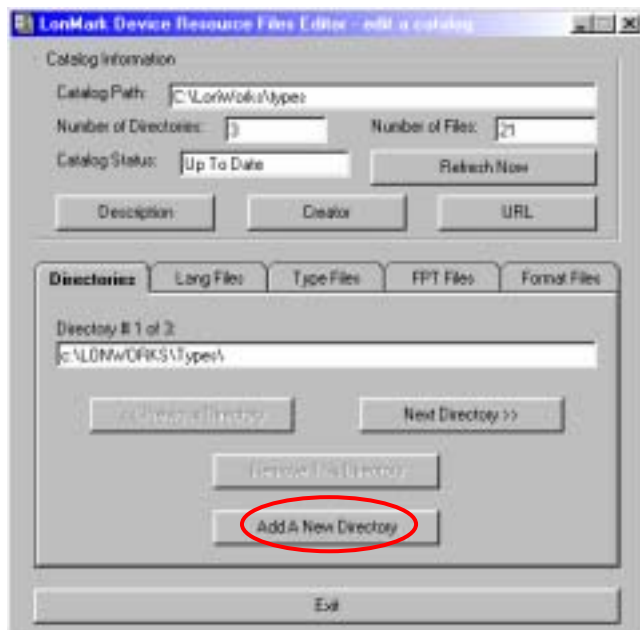
The resource files are named CAPE_EM.xxx.. They should be copied to *X:\lonworks\types\user\capelon\ls-t01*, where *X*: is the drive. Latest versions of the resource files can be downloaded from www.capelon.se.

Installation of Resource files

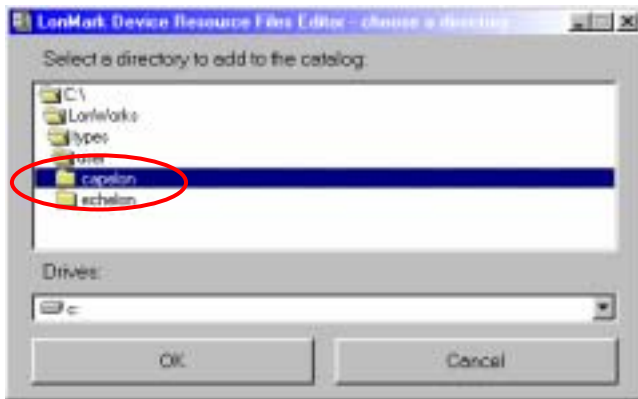
The installation of the resource files for the LL-10R is done by using the LNS Resource File Catalog Utility. This utility program may be found among your LNS or LonWorks utility programs.

The following instructions assume that the path to the resource file catalog (*LDRF.CAT*) is *C:\lonworks\types*.

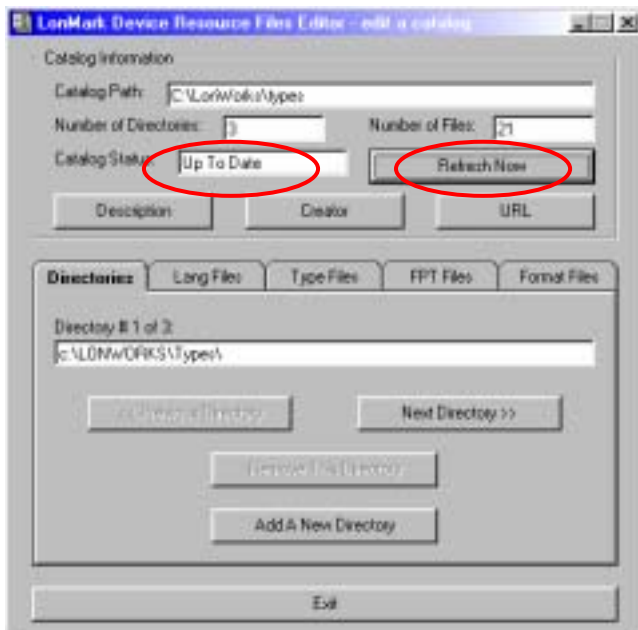
1. Copy the files *CAPE_EM.enu*, *CAPE_EM.fmt*, *CAPE_EM.fpt*, *CAPE_EM.sve* and *CAPE_EM.typ* to the target computer. We recommend to copy the resource files to *X:\lonworks\types\user\capelon\LL-10R*.
2. Close LonMaker and any other LNS program.
3. Start the utility program "LonMark Device Resource Files Editor" (*c:\lonworks\bin\LDRFCAT.EXE*). Note that this program sometimes is named "LNS Resource File Catalog Utility" after an LNS installation. Click the *OK* button to continue.
4. Select the folder *c:\lonworks\types* and click the *OK* button.
5. Click the *Add A New Directory* button.



6. Select the *types\user\capelon\ll-10r* folder and click the *OK* button. If the directory already exists in the catalog, go to step 7.



7. Click the *Refresh Now* button.
8. Check that *Catalog Status* field shows the *Up To Date* status.



9. Installation is complete. Click the *Exit* button to exit.

LNS-Plugin

A LNS-plugin for the LL-10R will be released during Q2 2007.

OTHER

Unconfigured

To set the node in an unconfigured state the service pin button should be pushed down when the node is reset/powerd up.

Wink

Wink is not supported.

Alias

Support 20 Alias.

Service Led

Indicates the state of the LL-10R

Off: Configured, normal state

Flashing (1 Hz): Unconfigured, LL-10R needs to be commissioned/configured

Steady Light: Error state/Applicationless, application program must be downloaded in LL-10R